

# Validating polarization implementations in 3D MCRT codes

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In astronomy, Monte Carlo Radiative transfer codes (MCRT) are often used to disentangle the interplay of the optical properties and the spatial distribution of cosmic dust. The majority of these codes are not able to calculate any polarization maps.

I will present the codes SKIRT and MC3D, in which we implemented the polarization of light due to scattering and extinction by dust. Our codes are capable of calculating the full Stokes vector ( $I$ ,  $Q$ ,  $U$ ,  $V$ ) for scattering of light by spherical grains, electrons, as well as scattering and extinction by aligned spheroids. In contrast to the implementations of other MCRT codes, ours uses co-moving reference frames that rely solely on the physical processes. This reduces the number of calculations and avoids certain numerical instabilities.

I will discuss analytical test cases that we developed to verify our implementations. These can be used in addition or instead of benchmarks comparisons with other codes, where the true solution is often unknown [1].

## References

- [1] Peest, C., Camps, P., Stalevski, M., Baes, M., and Siebenmorgen, R., 2017. Polarization in Monte Carlo radiative transfer and dust scattering polarization signatures of spiral galaxies. *Astron. Astrophys.* **601**, A92.

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